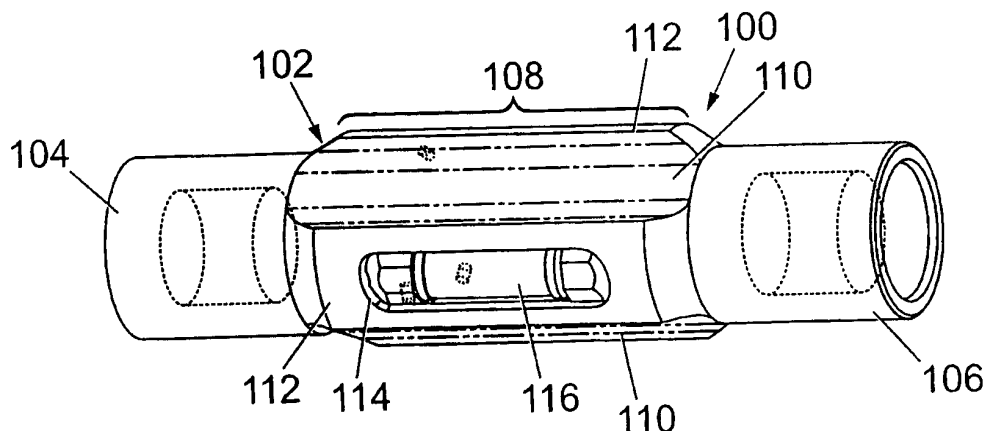




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : E21B 29/00, B21D 17/04, 39/04, E21B 29/10, B21D 39/10	A3	(11) International Publication Number: WO 00/37766 (43) International Publication Date: 29 June 2000 (29.06.00)
(21) International Application Number: PCT/GB99/04225 (22) International Filing Date: 21 December 1999 (21.12.99) (30) Priority Data: 9828234.6 22 December 1998 (22.12.98) GB 9900835.1 15 January 1999 (15.01.99) GB 9923783.6 8 October 1999 (08.10.99) GB 9924189.5 13 October 1999 (13.10.99) GB (71) Applicant (for all designated States except US): ASTEC DEVELOPMENTS LIMITED [GB/GB]; Burn of Daff Farm, Downies, Portlethen, Aberdeen AB1 4QX (GB). (72) Inventor; and (75) Inventor/Applicant (for US only): SIMPSON, Neil, Andrew, Abercrombie [GB/GB]; Burn of Daff Farm, Downies, Portlethen, Aberdeen AB1 4QX (GB). (74) Agent: PACITTI, Paolo; Murgitroyd & Company, 373 Scotland Street, Glasgow G5 8QA (GB).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> (88) Date of publication of the international search report: 16 November 2000 (16.11.00)

(54) Title: PROCEDURES AND EQUIPMENT FOR PROFILING AND JOINTING OF PIPES

**(57) Abstract**

Methods and apparatus for shaping pipes, tubes, liners, or casing at downhole locations in wells. Use is made of rollers bearing radially outwards against the inside wall of the pipe (etc.), the rollers being rolled around the pipe to cause outward plastic deformation which expands and shapes the pipe to a desired profile. Where one pipe is inside another, the two pipes can be joined without separate components (except optional seals). Landing nipples and liner hangers can be formed in situ. Valves can be deployed to a selected downhole location and there sealed to the casing or liner without separate packers. Casing can be deployed downhole in reduced-diameter lengths and then expanded to case a well without requiring larger diameter bores and casing further uphole. The invention enables simplified downhole working, and enables a well to be drilled and produced with the minimum downhole bore throughout its depth, obviating the need for large bores. When expanding lengths of casing, the casing does not need to be anchored or made pressure-tight. The profiling/expansion tools of the invention can be deployed downhole on coiled tubing, and operated without high tensile loads on the coiled tubing.

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INTERNATIONAL SEARCH REPORT

Int. Application No PCT/GB 99/04225		
A. CLASSIFICATION OF SUBJECT MATTER IPC 7 E21B29/00 B21D17/04 B21D39/04 E21B29/10 B21D39/10		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC 7 E21B B21D		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal, TULSA, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2 383 214 A (A.L. PROUT) 21 August 1945 (1945-08-21) page 2, column 1, line 6-14; figures 1,2 ---	1-6, 14, 19, 22, 25
X	US 2 627 891 A (P.B. CLARK) 10 February 1953 (1953-02-10) column 4, line 18-73; figures 1, 2, 4 ---	1-6, 14, 19, 22, 25
A	WO 93 24728 A (ASTEC DEV LTD ;SIMPSON NEIL ANDREW ABERCROMBI (GB); COEY RAYMOND P) 9 December 1993 (1993-12-09) cited in the application page 13, line 22 -page 14, line 13; figure 1 ---	1, 14, 25
A	US 3 818 734 A (J.W. BATEMAN) 25 June 1974 (1974-06-25) the whole document --- -/---	1, 14, 25
<div style="display: flex; justify-content: space-between;"> <input checked="" type="checkbox"/> Further documents are listed in the continuation of box C. <input checked="" type="checkbox"/> Patent family members are listed in annex. </div>		
<div style="display: flex;"> <div style="flex: 1;"> <p>* Special categories of cited documents :</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="flex: 1;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p> </div> </div>		
Date of the actual completion of the international search <div style="text-align: center; font-weight: bold;">16 June 2000</div>	Date of mailing of the international search report <div style="text-align: center; font-weight: bold;">28.06.00</div>	
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer <div style="text-align: center; font-weight: bold;">Schouten, A</div>	

INTERNATIONAL SEARCH REPORT

Int. Application No

PCT/GB 99/04225

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2 754 577 A (C.A. MAXWELL) 17 July 1956 (1956-07-17) column 2, line 21-39 column 3, line 39-42 ----	8,9,11, 12,29-32
X	US 2 898 971 A (G.A. HEMPEL) 11 August 1959 (1959-08-11) claim 1; figures 1-5 ----	8-10, 29-31
Y	-----	33
Y	US 4 371 199 A (KUSHNER GERALD J ET AL) 1 February 1983 (1983-02-01) column 2, line 43-51; figure 2 -----	33

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB 99/04225

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-7,14-28

Method and apparatus for profiling a pipe or other hollow tubular article,

2. Claims: 8-13,29-33

A method of conjoining two pipes or other hollow tubular articles.

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. Application No

PCT/GB 99/04225

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